

Hydrogen Flame Annealing Instructions for Au(111) substrates

The Au (111) substrates are high purity gold grown onto mica in a high vacuum. The resulting gold surface is 200 nm thick and composed of flat Au (111) terraces. Hydrogen flame annealing produces contaminant-free reconstructed Au (111) surfaces.

Materials required

1. Pressurized H₂ gas cylinder
2. Single stage high purity flow regulator
3. Anti-backflash arrester (purchased from your local welding supply house)
4. Square quartz plate
5. Small quartz piece (about 1 cm²)
6. Safety glasses
7. Torch: Quartz tube narrows to a fine tip with inner diameter less than 0.25 mm
8. PTFE tubing

Procedure

Place the quartz plate on the counter, with the gold substrate on top. Place the small quartz piece on the edge of the substrate to hold it in place.

Adjust the flow regulator to let just enough hydrogen pass through so that it is audible. Note that you may not see a reading on your flow regulator. Turn off all the lights (the darker the room, the better). Light the torch and adjust so that the flame is about 4 cm long. Gently heat the quartz plate around the substrate to assure even heating. When water vapor no longer condenses on the quartz, then it has been heated enough.

Now, bring the flame tip to the film at about a 30 degree angle. Sweep back and forth (at approx. 1 Hz freq.) for 30 to 60 seconds, keeping the small flame spot on the film a dim orange color. The optimum brightness will depend on the lighting of the room. In a normally lit room, you should not see the film glow at all. In an extremely dark room, the spot will become much more distinct. ***Do not overheat the film.*** The darker the room, the less chance of overheating and burning the sample.

Blow out the flame and turn off the regulator. Let the film cool off for a minute.

Safety reminders

- Be sure to wear glasses while annealing
- Do not ignite the flame before you turn off the lights
- When finished, blow out the flame, turn off the tank, vent the rest of the gas, and turn off the regulator.